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Beach, Marine and River Water Quality of Hong Kong in 2022

PURPOSE

The Environmental Protection Department (EPD) conducts long-term routine monitoring of the water quality of our gazetted beaches, marine and river waters, and publishes relevant annual reports. This paper is to keep members informed of the key findings of the 2022 beach, marine and river water quality reports released in April and August 2023 by the EPD (<https://www.epd.gov.hk>).

KEY HIGHLIGHTS

2. In line with the vision to develop Hong Kong into a smart city and to enhance the protection of public health, the EPD launched the Beach Water Quality Forecast (BWQF) System on 15 August 2023 to provide daily water quality forecasts, with data updated every morning, for all gazetted beaches in Hong Kong that are open for swimming to supplement the existing beach water quality monitoring programme.

3. The system is jointly developed by the EPD and the Hong Kong University of Science and Technology, using statistical multiple linear regression model which takes into account the most relevant and latest environmental and hydrometeorological parameters, including microbiological data, rainfall, onshore wind, tide level, salinity, solar radiation and water temperature, to forecast the daily *E. coli* level in beach waters.

4. The forecast results are then converted into an easy-to-understand BWQF Index similar to the existing beach rating system. Since the launch of the BWQF System, members of the public can obtain the latest daily BWQF information through the BWQF mobile application (available for download from: www.epd.gov.hk/en/BWQApp) or the EPD's dedicated BWQF website (www.epd.gov.hk/en/BWQForecast) to facilitate early planning of water recreation activities.

BACKGROUND

Beach Water Quality

5. The EPD routinely monitors and assesses the water quality of 42 gazetted beaches in Hong Kong through weekly sampling during bathing season between March and October. Beach water quality is assessed through a ranking system, under which the beaches are rated as “Good”, “Fair”, “Poor” or “Very Poor” according to the level of *E. coli* bacteria, corresponding to swimming-associated health risks.

6. Beaches with the annual geometric mean of *E. coli* levels at or below 24 per 100 mL are ranked as “Good”, between 25 and 180 per 100 mL as “Fair”, between 181 and 610 per 100 mL as “Poor”, and above 610 per 100 mL as “Very Poor”. Beaches receiving a “Good” or “Fair” ranking meet the bacteriological Water Quality Objective (WQO) for bathing waters. For beaches ranked as “Very Poor”, their *E. coli* levels correspond to a swimming-associated illness rate of more than 15 cases per 1,000 swimmers, and they are generally considered not suitable for swimming.

Marine Water Quality

7. The EPD monitors the marine water quality of Hong Kong at 76 monitoring stations in open waters of ten Water Control Zones (WCZs) on a monthly basis. Marine water quality is assessed through the overall marine WQO compliance rate which is calculated based on the overall average of the compliance rates for all monitoring stations of the four key parameters, namely dissolved oxygen (DO), total inorganic nitrogen (TIN), unionised ammonia nitrogen (NH₃-N) and *E. coli* bacteria.

River Water Quality

8. The EPD’s river monitoring programme currently covers 82 monitoring stations at 30 watercourses. Five representative parameters, including pH, suspended solids (SS), DO, 5-day biochemical oxygen demand (BOD₅) and chemical oxygen demand (COD), are used to assess compliance with the WQOs applicable for individual monitoring stations in various WCZs. The EPD has been using the Water Quality Index (WQI) to indicate the general health of a river, which is rated as “Excellent”, “Good”, “Fair”, “Bad” and “Very Bad” according to the levels of DO, BOD₅ and ammonia nitrogen (NH₄-N).

LATEST DEVELOPMENT

Beach Water Quality

9. In 2022, all 42 gazetted beaches continued to comply with the bacteriological WQO for bathing waters (100%)¹. Among them 27 beaches (or 64%) were ranked as “Good” and 15 beaches (or 36%) were ranked as “Fair” (see **Figures 1 and 2 in Annex**). None of the beaches were ranked as "Poor" or "Very Poor". The record of full compliance with the WQO has maintained for 13 consecutive years since 2010.

10. While the overall beach water quality remained satisfactory, there was a slight decline in the number of beaches ranked as “Good” in 2022 as compared with that in 2021 (viz. a decline from 30 to 27 as shown in **Figure 3 in Annex**). This was primarily due to the water quality fluctuations particularly observed at beaches in Tsuen Wan and Tuen Mun districts and associated with frequent and consecutive heavy rainstorms occurred between May and August 2022. These fluctuations were largely transient and weather-associated. When there was less rainfall after mid-August 2022, relatively stable water quality with continuous improvement at these beaches was observed.

11. A significant long-term trend of beach water quality improvement over the past three decades can be clearly seen, as reflected by the increase of the bacteriological WQO compliance rate from 74% in 1986 to a steady 100% since 2010 (see **Figure 3 in Annex**). The achievement is attributable to the Government's continuous efforts and extensive resource dedicated to implement various pollution control and environmental improvement measures, including the enforcement of the Water Pollution Control Ordinance (WPCO) and Livestock Waste Control Scheme (LWCS) under the Waste Disposal Ordinance (Cap. 354), extension of the sewerage network to the beach hinterlands, implementation of the Harbour Area Treatment Scheme (HATS), and provision of new sewage treatment facilities.

Marine Water Quality

12. In 2022, our marine waters attained an overall WQO compliance rate of 86%, sustaining the long-term general improving trend observed in the past decade when the compliance rate was only close to 80% in 2012 (see **Figure 4 in Annex**). Among the four key WQO parameters, both NH₃-N and *E. coli* bacteria maintained 100% compliance for all applicable WCZs. The compliance rate for DO was 92%, while that for TIN was 62% which was largely attributed to the high background levels under the influence of the Pearl River Estuary.

¹ The monitoring of beach water quality was suspended between mid-March and April 2022 due to temporary closure of beaches as a result of the COVID-19 pandemic. The EPD resumed beach water quality monitoring work on 5 May 2022 upon the re-opening of beaches.

13. The water quality of Victoria Harbour continued to show noticeable improvements along with the staged implementation of the HATS (see **Figure 5** in **Annex**). The parameters that show significant improvements in 2022 as compared with those levels before the introduction of HATS (1997-2001) include *E. coli* bacteria (reduced by 85%), NH₃-N (reduced by 59%) and TIN (reduced by 23%).

14. Among the ten WCZs, three WCZs, namely the Eastern Buffer WCZ, Junk Bay WCZ and Western Buffer WCZ, fully achieved the WQOs in 2022. They are closely followed by the Port Shelter WCZ with 97% compliance, Mirs Bay WCZ with 96% compliance, Victoria Harbour WCZ with 93% compliance and North Western WCZ which achieved 83% compliance. The WQO compliance rates for the remaining three WCZs, namely Deep Bay WCZ (67%), Southern WCZ (69%) and Tolo Harbour and Channel WCZ (79%), were generally within their normal fluctuations as observed in the past few years.

15. The WQO compliance rates for Tolo Harbour and Channel WCZ and Southern WCZ were mainly ascribed to the natural phenomenon of lower DO levels due to water column stratification in summer, and high background TIN levels under the influence of seasonal estuarine discharges, respectively. With the measures under the Deep Bay Water Pollution Control Joint Implementation Programme taken progressively by Hong Kong and Shenzhen, there has been significant improvement in water quality in Deep Bay. The overall WQO compliance rate for Deep Bay WCZ had been improved from an average of 47% in 2009-2018 to 67% in 2022. The untiring efforts by both governments to pursue pollution control measures, including the extension and improvement of sewerage infrastructures, would effectively help reduce pollution loads entering these waters and sustain the noticeable improvement in water quality.

16. In 2022, there were seven red tide incidents reported in Hong Kong waters, less than the average of 12 incidents in the past five years (2017-2021) (see **Figure 6** in **Annex**). These natural incidents were caused by seven phytoplankton species, most of which are not harmful to marine lives. No red tide related fish kill in Hong Kong waters was recorded in 2022.

River Water Quality

17. The overall water quality of Hong Kong's rivers continued to perform satisfactorily in 2022. In terms of key WQOs, the overall compliance rate in 2022 was 88%, which has registered a significant improvement over that of 48% back in 1987 (see **Figure 7** in **Annex**).

18. With regard to the Water Quality Index (WQI) which indicates the overall state of health of the watercourses, 84% of the river monitoring stations were graded "Excellent" or "Good" in 2022, as compared with only 26% in 1987. These more pristine watercourses are mainly located in Lantau Island, eastern and southwestern New Territories, and Kowloon.

19. The high WQO compliance rates and WQI gradings were the result of effective pollution control measures taken under the WPCO and the LWCS, as well as the progressive extension of sewerage network to more villages under the Sewerage Master Plans, despite the fact that the population in the New Territories where most of the rivers lie has doubled in the last three decades.

20. The water quality of some rivers in the western part of the New Territories remained to be improved as they were adversely affected by runoff from unsewered village houses, expedient connections in old districts and illegal discharges from livestock farms. For example, Yuen Long Creek and Kam Tin River maintained the WQO compliance rate at about 50% with WQI grading of “Fair” or “Bad” respectively, showing no sign of further deterioration in river water quality. The Government will continue to step up law enforcement actions against illegal discharges in these areas, and enhance the sewerage infrastructure by upgrading sewage treatment facilities, extending sewerage network and installing dry weather flow interceptors at appropriate locations, etc.

WAY FORWARD

21. Our environmental water quality continued to perform well in 2022 with an overall WQO compliance rate for gazetted beaches, marine and river waters at 100%, 86% and 88%, respectively. In districts with more serious odour nuisance at seafront, we have proactively investigated and traced the major pollution sources in the stormwater drainage systems and engaged government departments including the Drainage Services Department and Buildings Department to follow up on the rectification of sewer misconnections.

22. As stated in the 2022 Policy Address, we are working progressively towards the target of reducing the pollution loading by half at stormwater outfalls with serious pollution problems on both sides of Victoria Harbour, in particular in Tsuen Wan, Sham Shui Po and Kowloon City districts, by the end of 2024. As at end September 2023, the pollution loading at identified outfalls has already reduced by about 30%.

23. In the coming years, we will further enhance our water quality management capability and focus on tackling pollution problems encountered in the near shore waters of Victoria Harbour and pollution-prone rivers in the New Territories. We will continue to leverage the latest advancement of smart technology to apply solutions for more effective sewer misconnection identification, rectification and pollution interception so as to further improve our water quality.

Environmental Protection Department
October 2023

Figure 1 Annual ranking of gazetted beaches in 2022

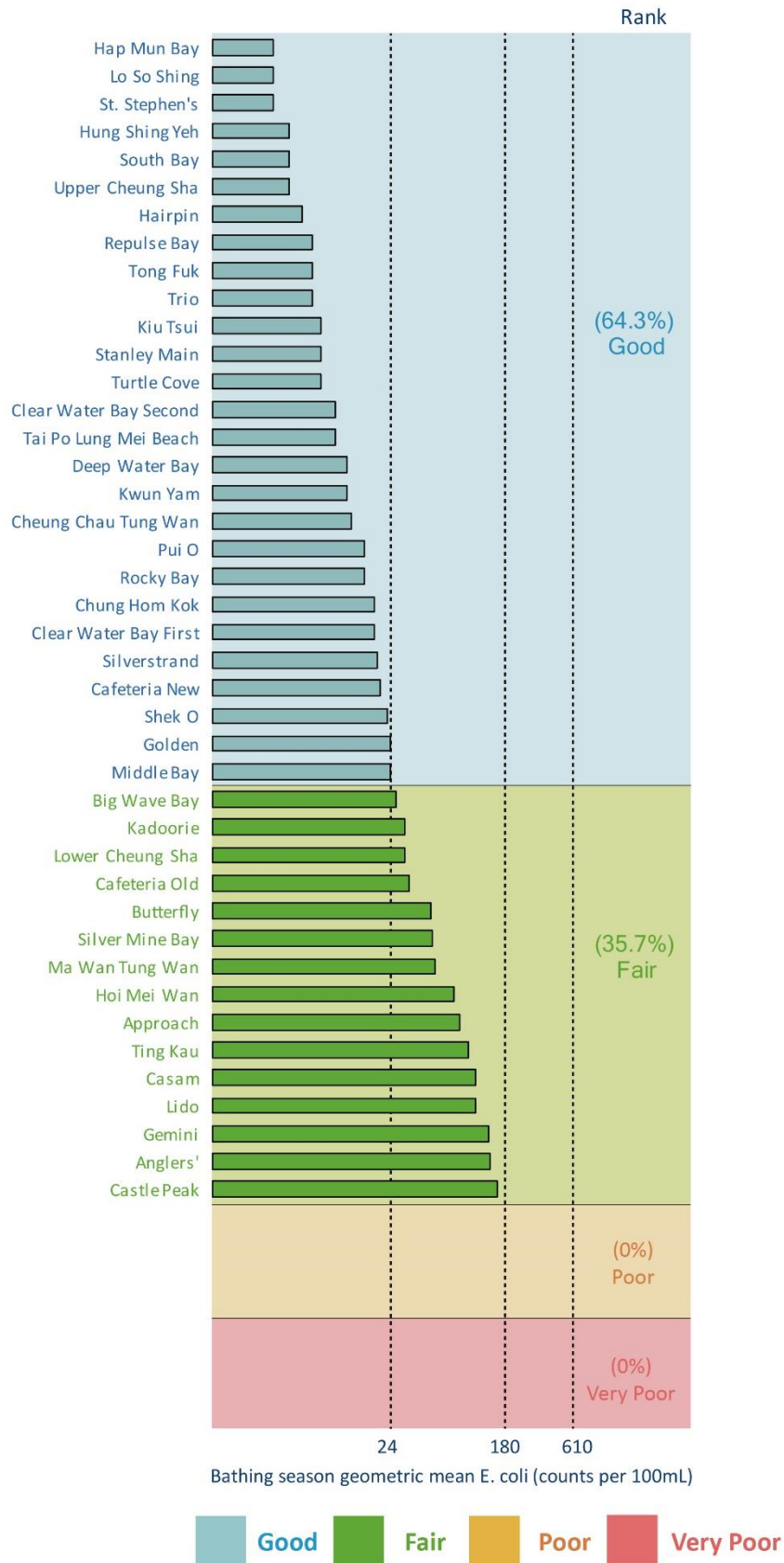
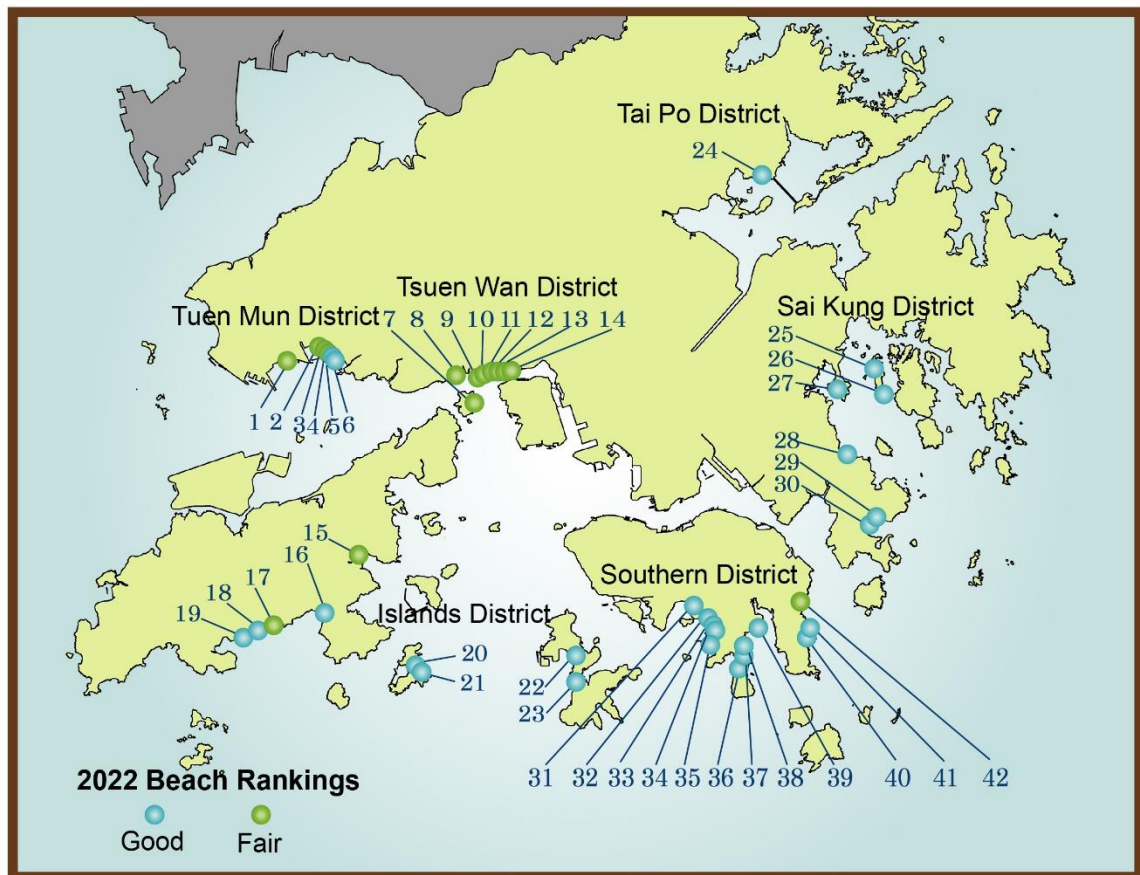


Figure 2 Distribution of gazetted beaches and their annual ranking in 2022



Tuen Mun District

1. Butterfly
2. Castle Peak
3. Kadoorie
4. Cafeteria Old
5. Cafeteria New
6. Golden

Tsuen Wan District

7. Ma Wan Tung Wan
8. Anglers' *
9. Gemini *
10. Hoi Mei Wan
11. Casam
12. Lido
13. Ting Kau
14. Approach

Islands District

15. Silver Mine Bay
16. Pui O
17. Lower Cheung Sha
18. Upper Cheung Sha
19. Tong Fuk
20. Cheung Chau Tung Wan
21. Kwun Yam
22. Hung Shing Yeh
23. Lo So Shing

Tai Po District

24. Tai Po Lung Mei

Sai Kung District

25. Kiu Tsui
26. Hap Mun Bay
27. Trio
28. Silverstrand
29. Clear Water Bay First
30. Clear Water Bay Second

Southern District

31. Deep Water Bay
32. Repulse Bay
33. Middle Bay
34. South Bay
35. Chung Hom Kok
36. St. Stephen's
37. Stanley Main
38. Hairpin *
39. Turtle Cove
40. Shek O
41. Rocky Bay *
42. Big Wave Bay

* Beaches not open for swimming (no lifeguard service provided by Leisure and Cultural Services Department)

Figure 3 Annual ranking of gazetted beaches from 1986 to 2022

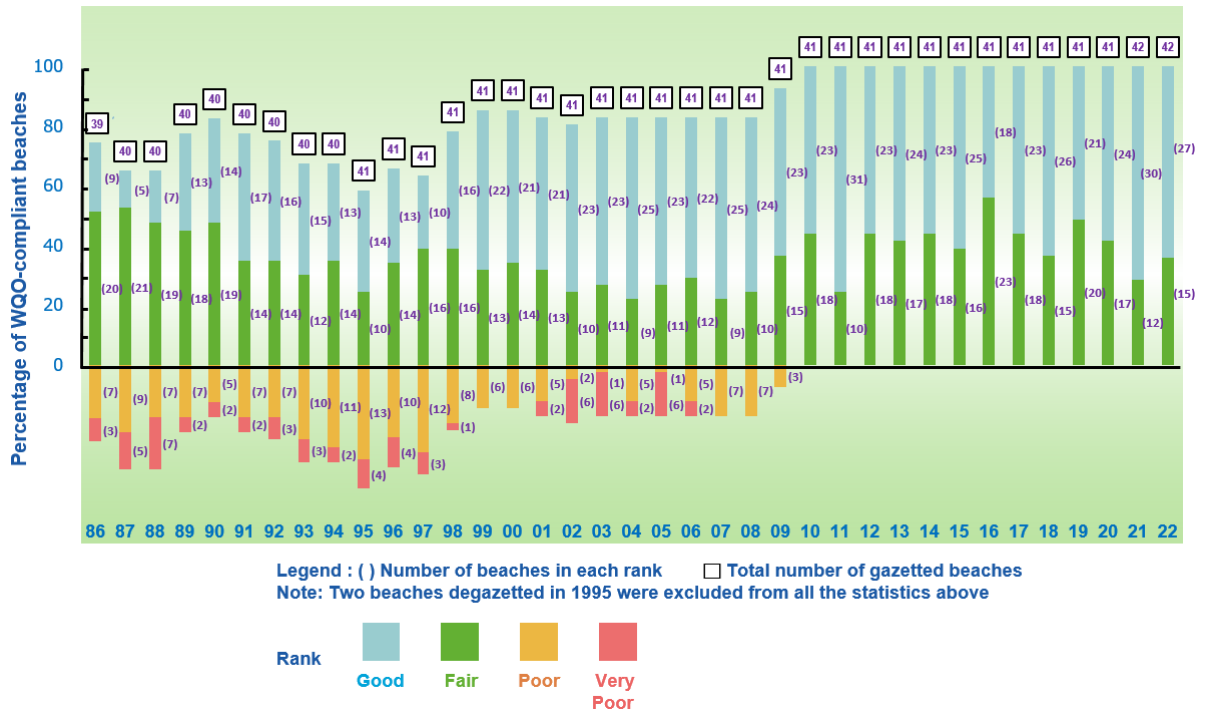


Figure 4 Overall marine WQO compliance rates of Hong Kong, 1986-2022

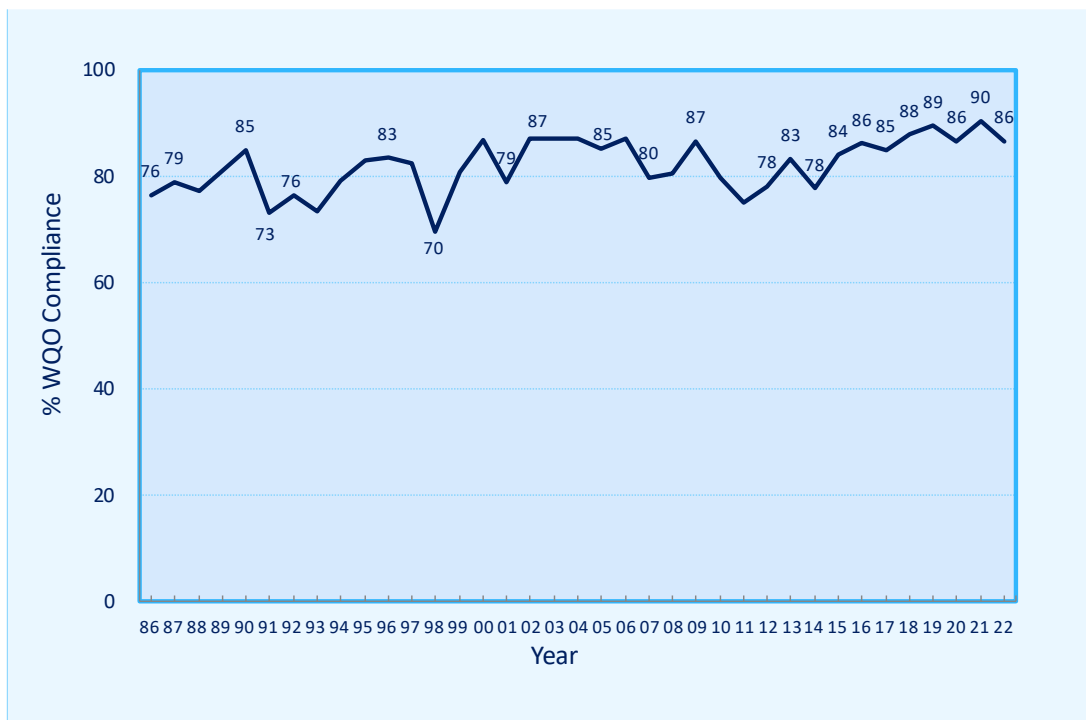


Figure 5 Water quality improvement in Victoria Harbour since the implementation of Harbour Area Treatment Scheme (HATS)

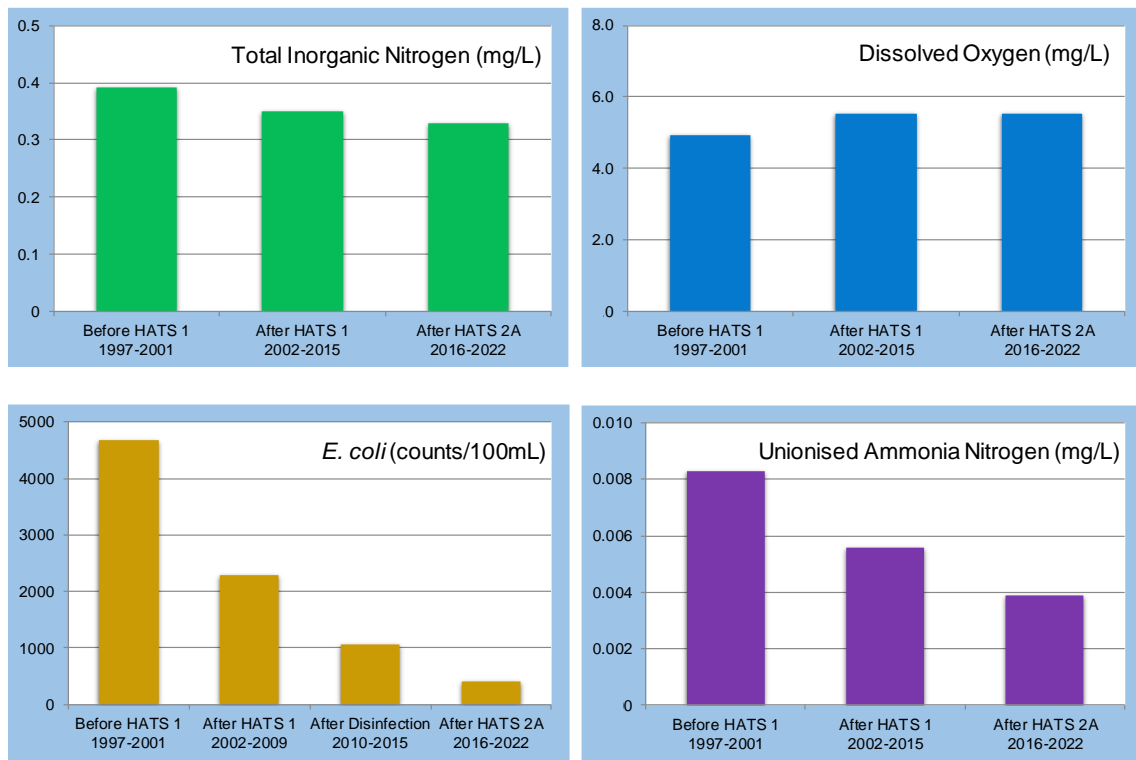


Figure 6 Occurrence of red tides in Hong Kong waters, 2000-2022

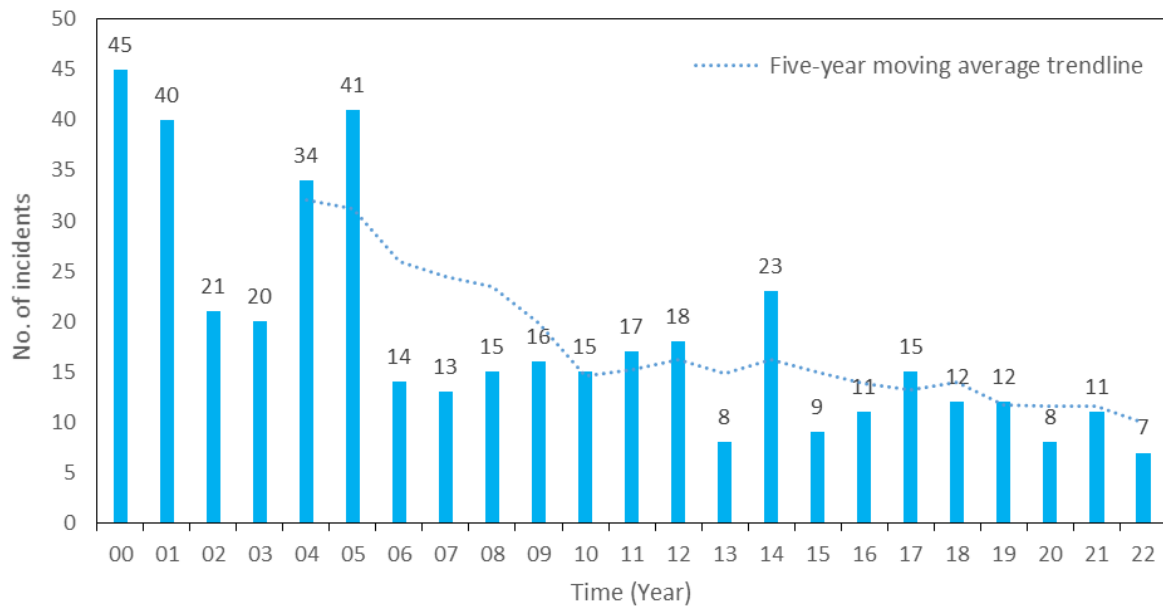


Figure 7 Overall river WQO compliance rates of Hong Kong, 1987-2022

